Reconnaissance Survey of Mercury in Selected Game Fish from the San Joaquin River Basin

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Public Comments

No public comments were received for this proposal.

Technical Synthesis Panel Review

Proposal Title

#0101: Reconnaissance Survey of Mercury in Selected Game Fish from the San Joaquin River Basin

Final Panel Rating
inadequate

Technical Synthesis Panel (Primary) Review

TSP Primary Reviewer's Evaluation Summary And Rating:

The PIs present a strong case for measuring Hg levels in game fish in reservoirs of the San Joaquin Valley. Watersheds of these reservoirs have been impacted by the effects of historic gold mining activities and it is assumed that Hg has entered these water bodies in significant amounts. Much of the current fish monitoring activities funded through this program have been confined to the Bay–Delta area, but these impoundments (8 of 9 in the foothills of the Sierra Nevada) are frequented by sportfishers who would potentially consume contaminated fish. While the need for such a study is justified, the current proposal is very descriptive at best and lacks the detail of study design necessary to provide a thorough assessment of the extent of Hg contamination in fish. Reviewers have provided many suggestions for revision and possible resubmission and the lead panelist agrees with their assessment. Among the criticisms is the need to use a stratified random sampling approach, consideration of using young of the year fish to detect interannual changes in ambient Hg and consideration of health risks based on the size of fish commonly taken. The two year scope of the project will not allow adequate determination of temporal variability. Further, this study would have much greater value if it were paired with a study geared toward understanding biogeochemical cycling of Hg in

the reservoirs as well as trophic interactions.

Additional Comments:

These PIs should consider pairing with another group in the area that has more experience in Hg cycling in lakes and reservoirs. A simple monitoring project (15 fish, 9 reservoirs, 2 years) would have much greater value with stronger sampling design and coupling to some in-lake measurements of total and methyl Hg.

The PIs present a strong case for measuring Hg levels in game fish in reservoirs of the San Joaquin Valley. Watersheds of these reservoirs have been impacted by the effects of historic gold mining activities and it is assumed that Hg has entered these water bodies in significant amounts. Much of the current fish monitoring activities funded through this program have been confined to the Bay-Delta area, but these impoundments (8 of 9 in the foothills of the Sierra Nevada) are frequented by sportfishers who would potentially consume contaminated fish. While the need for such a study is justified, the current proposal is very descriptive at best and lacks the detail of study design necessary to provide a thorough assessment of the extent of Hg contamination in fish. Reviewers have provided many suggestions for revision and possible resubmission and the lead panelist agrees with their assessment. Among the criticisms is the need to use a stratified random sampling approach, consideration of using young of the year fish to detect interannual changes in ambient Hg and consideration of health risks based on the size of fish commonly taken. The two year scope of the project will not allow adequate determination of temporal variability. Further, this study would have much greater value if it were paired with a study geared toward understanding biogeochemical cycling of Hg in the reservoirs as well as trophic interactions.

Technical Synthesis Panel (Discussion) Review

TSP Observations, Findings And Recommendations:

The panel concurred with the primary reviewer's comments. They agreed that mercury in reservoirs draining watersheds in the Sierra Nevada region was an important topic, however the proposal was very descriptive and lacked sufficient study design to evaluate the extent of contamination and to provide adequate data that would truly address the objectives.

The panel discussed the disparity of external reviews (Excellent, Fair, Fair) and felt that the excellent review did not address the study design details to the extent of the other reviews, with the exception of suggesting to extend the study for an additional year. External reviewers provided excellent comments for consideration if the researchers decide to resubmit a proposal.

Rating: inadequate

Technical Review #1

proposal title: Reconnaissance Survey of Mercury in Selected Game Fish from the San Joaquin River Basin

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The goal of this project is to increase understanding of the Hg burden of game fish in reservoirs of the San Joaquin River watershed. The objectives include sampling a variety of fish from reservoirs throughout the watershed, analyzing for Hg (as a surrogate for MeHg), and developing models of spatial, temporal, and age−class body burdens. The authors hypothesis that there will be a spatial north−south gradient to MeHg burden, that burden will not change in age−class over time, and that certain fish higher on the food chain and older will have greater MeHg burdens. These goals, objectives and hypotheses are all clearly stated and internally consistent.** **The idea is timely and important. Considerable effort has been spent on describing Hg distributions in the Sacramento River watershed but far less information is available for the San Joaquin. Given what is known or genrally accepted about Hg biouptake, there is a good possibility that fish in San Joaquin watershed reservoirs will carry significant burdens of MeHg. This information should be developed soon, if only to put Sacramento River Hg cleanup and regulation efforts in perspective.**
Rating	**excellent**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The study is justiified by existing knowledge. Limited sampling (of both water and fish) in the area indicate levels of Hg suggesting significant Hg burdens in fish from the watershed.** **The conceptual model (i.e. that observed MeHg concentrations suggest Hg at levels of concern in the food chain) is correct and provides a solid basis for the proposed work. The level of effort is relatively small and well justified.**
Rating	**excellent**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**The approach seems well−designed except in one respect. I think that it will be difficult to establish any temporal trends with just 2 years of data. Although Hg burdens in age−classes are not expected to change from year−to−year, there is always uncertainty and random variation in the data. I would think that at least 3 years of data would be needed to even suggest a trend or lack thereof.** **The project will generate information useful to decision−makers and scientists.**
Rating	**very good**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**The approach is well documented and technically feasible. The work is relatively straightforward and well within the grasp of the authors, who have experience with fish collection. USGS labs have extensive experience with Hg analyses. Except for the issue of temporal trends (see approach), the project has a high likelyhood of success.**
Rating	**very good**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**Monitoring (in this case, fish collection) seems appropriately designed. Appropriate controls appear to be in place to interpret and develop data.**
Rating	**excellent**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**Products will be of value. The project will contirbute to our larger database of information on Hg burdens in California reservoirs. The authors do not mention larger data management systems or incorporating their data into such systems. This failure should be addressed. There must, by now, be a comprehensive database for Hg distribution in California.**

	Interpretive outcomes will result from this project in the form of models of spatial, temporal, and age-class body burdens in fish fro the area. These will be interesting to compare with similar models developed for other parts of California and in the world.
Rating	very good

Additional Comments

Comments	None.

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	The project team appear to be well-qualified to succesfully complete this project. The USGS infrastructure and experience of USGS scientists should provide support necessary for success. The plan, as structured, seems to be efficient and cost-effective. I don't know of the authors track records.
Rating	very good

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	The budget seems both reasonable and adequate.
Rating	excellent

Overall

Provide a brief explanation of your summary rating.

Comments	**This is a clearly defined and straightforward project that will produce useful information at a reasonable cost. I would consider adding another year to sampling, just to better establish any temporal trends that may or may not exist and to better define average body burdens. But this study is sufficient to indicate the levels of Hg that can be expected in fish from the San Joaquin River watershed.**
Rating	**excellent**

Technical Review #2

proposal title: Reconnaissance Survey of Mercury in Selected Game Fish from the San Joaquin River Basin

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The goals and objectives of the proposal are clearly stated and internally consistent within the proposal. Namely, the objectives are to (1) determine if mercury concentrations vary among fish species of different sizes; (2) determine if mercury concentrations in fish vary among reservoirs; (3) determine if mercury concentrations in fish within a reservoir vary between years; and (4) determine if mercury concentrations in fish approach or exceed human health criteria. Information on mercury concentrations in freshwater fish is necessary for the establishment of fish health consumption advisories and protection of public health. In addition, it is important to determine current concentrations to serve as a baseline for comparison for future restoration (if any) projects or watershed modifications.**
Rating	**very good**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The study is justified as there is little information on mercury concentrations in game fish from the San**

	Joaquin River basin. A pilot project is not necessary as methods for sampling and analyzing fish for mercury are well established.
Rating	**very good**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**The design of the project could be greatly strengthened relative to the stated objectives and may have some existing deficiencies if the state of California already has a standardized sampling protocol in place. Relative to the stated objectives, the following recommendations are made: (1) The proposal indicates that the first 15 individuals of each of three species collected will be retained for analysis. A stratified-random sampling design should be employed to insure that fish of multiple size classes will be collected. Is fifteen fish an adequate sample size to establish a good relationship between mercury concentration and fish length? No data is presented to indicate the basis for the selection of sample size. (2) Data from other similar studies conducted in the Central Valley could be used to determine sample size requirements to obtain fish length-Hg relationships with pre-determined level of precision. Mercury concentrations in fish will vary among reservoirs, but will the sample size be large enough to detect differences? (3) Determination of mercury concentrations in axial muscle of piscivorous fish would indicate gradual changes in methylmercury in the fish population, but will not detect changes in methylmercury loading to the system within such a short period of time (1-2 years). Young-of-year or age 1 fish would be better candidates for purposes of monitoring trends in methylmercury. If long-term**

	monitoring of these 9 reservoirs is not a foreseeable goal, then it would be more cost effective and improve the precision of the mercury estimates by doubling the sampling size in the first year and eliminating the second year of the study. (4) To determine if mercury concentrations in fish approach or exceed human health criteria, consideration of the size of fish commonly caught and consumed by anglers should be considered and incorporated into the study design. The information generated will add to the base of knowledge of mercury concentrations in fish, but it's utility to decision makers is unknown. I.E., How does the data to be generated fit in with the long-term plan of the California Office of Health Hazard Assessment to monitor mercury concentrations in freshwater fish? There is no indication that the proposal has considered coordination with the state and the use of the data by the state in the issuance of fish consumption advisories. I am unsure of the need or the utility of collecting site physical/chemical measurements with the hydrolab. As the proposal currently is written, there is no plan to correlate mercury concentrations with fish or propose mechanisms to account for differences in mercury concentrations among species or reservoirs.
Rating	**fair**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**Yes, the approach is documented and technically feasible with a high likelihood of success. With the exception of those issues mentioned in the comments on the proposal approach, the project is consistent with objectives. The authors have extensive experience in the collection of fish with passive and active sampling gears and in the assessment of fish for trace metals.**

Rating	**very good**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**Beyond presentations and reports, the proposal gives no indication on how this data will be shared with stakeholders or on how information will be developed for public dissemination. Moreover, though only 2 years of sampling is requested, consideration should be given into developing sampling protocols that are consistent with a long−term monitoring program designed to detect trends in mercury concentration in fish. Sampling large piscivorous fish will not detect changes, if any, in methlmercury loading between the two years. In addition, in order for this data to have wider applicability, these protocols should be consistent with those developed by the state of California for monitoring freshwater fish for mercury.**
Rating	**fair**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**Mercury concentrations in piscivorous fish commonly consumed by anglers in nine reservoirs will be determined. Relevance to larger data management systems are unknown and were not considered in the proposal.**
Rating	**fair**

Additional Comments

Comments	**None**

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**Based on publication in refereed journals, the proposal authors have a very good track record of project management and completion. They have assembled a project team that is more than qualified to implement the proposed project. Infrastructure and other support services are adequate for project completion.**
Rating	**excellent**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**Costs for analysis of total mercury in fish filets are reasonable. But, personnel costs associated with collection, sample preparation (filleting) and shipment, data analysis and reporting are greatly overestimated. For example, it should not require eight weeks (PI) to sixteen weeks (biological technicians) per year to collect 45 fish from each of 9 reservoirs.**
Rating	**fair**

Overall

Provide a brief explanation of your summary rating.

Comments	

	Though data on mercury concentrations in fish consumed by anglers in these reservoirs is needed, the sampling design and protocol should be developed to be amenable to monitoring long-term trends in mercury concentrations in fish. In addition, in order for the results to be comparable with other water bodies in the state, these protocols should be coordinated with those of the state of California in monitoring freshwater fish for mercury. The budget overestimates the relative cost of fish collection, analysis, and reporting.
Rating	**fair**

Technical Review #3

proposal title: Reconnaissance Survey of Mercury in Selected Game Fish from the San Joaquin River Basin

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**Goals are clearly stated in the proposal, but the study is completely descriptive in nature, and does not attempt to address the more general and interesting question of why Hg levels in fish vary among−systems in this region. Perhaps among−site differences are related to watershed characteristics? Or the length of the food chain? Such issues are not even considered or discussed in the proposal.**
Rating	**fair**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**There is some justification for the approach they use. For example, we would expect that piscivorous fishes would be higher in Hg due to their higher trophic level, and that adults would be higher in Hg than juveniles, but these patterns have already been well−described from the literature.**
Rating	**good**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**Since the study includes only game fishes, measurement of total (rather than methyl) mercury is acceptable. Exclusion of lower trophic levels (inverts and smaller fish species) from the study reduces the overall value of the study. Also, many modern Hg studies are using stable isotope ratios of carbon and nitrogen to assess food web structure. This is an inexpensive approach that allows investigators to assess the importance of food chain length versus 'source' effects in studies of Hg. The value of this approach is particularly high in cross-system comparative studies, such as proposed here. Water quality information will be collected by the investigators, but is there a reason for this? Will it be linked to the Hg data in some way?**
Rating	**fair**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**The project is feasible, and the investigators would likely be able to achieve their objectives. The project is not particularly ambitious, and lacks a broader framework for understanding patterns of Hg variability in the environment.**
Rating	**fair**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**There is no experimental component to this study, but monitoring for Hg in fish is of societal value, and Hg levels in this region of California are not well−known. In general, Hg levels in fish do not differ widely from year−to−year. It would be best to collect fish in two consecutive years from a smaller subset of the study systems to determine whether multi−year sampling is needed to get a general estimate of Hg levels. One other concern is that size−based analyses would only be conducted if Hg levels exceed 0.3 ug/g. Even if Hg levels are below this limit, examining Hg patterns as a function of size is important since Hg exposure in humans is a product of Hg concentration in fish and the total level of fish consumption.**
Rating	**fair**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**Products would be site−specific information about Hg levels in game fishes from San Joaquin Basin reservoirs. Larger data management and integration issues do not appear to be considered.**
Rating	**fair**

Additional Comments

Comments

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**The investigators have worked on a range of topics, and although they appear not to have worked on Hg extensively, they appear qualified for this work.**
Rating	**good**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**Budget appears high for this relatively simple study.**
Rating	**fair**

Overall

Provide a brief explanation of your summary rating.

Comments	**This proposal does not go beyond simply measuring Hg levels in gamefish in a series of San Joaquin basin reservoirs. The broader context is lacking, and the quality of the science is not nearly as high as it could be. I would encourage the investigators to combine the descriptive monitoring approach with more extensive efforts to understand, explain, and predict Hg variability on the landscape.**
Rating	**fair**